



## NASA SBIR 2005 Phase I Solicitation

### X1.03 Sensing and Imaging

Lead Center: JPL

Participating Center(s): GSFC, LaRC

Sensing and imaging systems can provide a number of capabilities required for anticipated NASA missions including exploration of Mars and the Moon. Capabilities of interest include the following:

- Orbiting sensors to map:
  - Extent and concentration of useful, surface, or subsurface resources to identify promising outpost or science sites and traversable terrains;
  - Surface topography and roughness to identify promising safe landing sites for human, robotic science, and pre-provisioning missions, and to guide pinpoint landing algorithms.
- Robot-mounted sensors for: estimating robot pose and motion; recovering 3D scene structure; identifying hazards or objects of interest; identifying articulation of observed objects, and performing visual serving. Flight ready (radiation and temperature hardened), high cycle rate, and low power systems are generally preferred. Applications include:
  - Autonomous rendezvous and docking;
  - Pinpoint landing;
  - Surface navigation;
  - Surface and on-orbit assembly/construction;
  - Resource mining/processing;
  - Multi-vehicle cooperation.

Specific technologies of interest in addressing these challenges include:

- Rapid frame rate arrays for 1, 1.5 and 2  $\mu\text{m}$  vision (2D and 3D);
- Multi-wavelength laser arrays;

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- Flight-ready, high-speed, medium-resolution (640x480) stereo-vision sensors;
  - Flight-ready, low-power lighting systems (headlights) to allow imaging during nighttime robotic operations;
  - Tightly coupled inertial and vision sensors for pose estimation;
  - Ground truthing systems for evaluating performance of ranging systems.

A number of related technologies are of interest but are covered under other subtopics, including:

- High power or high rep-rate lasers (S6.02, S1.04);
- Ultra-high sensitivity detectors and arrays (S4.01);
- Active and passive microwave sensors (S6.04, S6.05).